

REMARKS

Claims 5, 6 and 11 have been amended and no claims have been canceled. Accordingly, claims 5-7, 9 and 11 are pending in the application.

Claim Rejections under 35 U.S.C. §112

Claims 5-7, 9 and 11 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite in that claim 11 includes the limitation "a flow rate of the liquid discharge from the upstream-side plunger pump is greater than a flow rate of the liquid stored in the downstream-side plunger pump".

It is the Examiner's position that concept of a "flow rate" for the stored liquid is unclear. By this amendment, claim 11 has been amended to refer throughout to the upstream-side plunger pump as a first pump and the downstream-side plunger pump as a second pump and the phrase objected to by the Examiner has been amended to read "to make a flow rate of the liquid discharged from the first pump greater than a flow rate of the liquid taken into the second pump". Thus the portion of the claim objected to by the Examiner now refers to a flow rate of the liquid taken into the second pump.

It is submitted that this amendment to claim 11 now overcomes the Examiner's rejection of the claims under 35 U.S.C. §112, second paragraph.

Claim rejections under 35 U.S.C. §102 and §103

Claims 5, 6 and 11 stand rejected under 35 U.S.C. §102(b) as being anticipated by Bez, USP 5,482,443.

Claims 7 and 9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sugiyama et al., USP 6,122,049 in view of Bez, USP 5,482,443, and further in view of Gerhardt et al., USP 6,712,587.

For the reasons set forth hereafter, it is submitted that claims 5-7, 9 and 11, as amended, are patentable.

Patentability Of The Claims

Claim 11, the only independent claim in the application, has been amended to additionally recite a first motor for driving a plunger of the first pump and a second motor for driving a plunger of the second pump whereby the plunger of the first pump and the plunger of the second pump may be driven at different speeds from each

other. Claim 11 has also been amended as noted above to refer to a flow rate of the liquid taken into the second pump in the last two lines of the claim as well as to refer to the upstream-side plunger pump as a first pump and the downstream-side plunger pump as a second pump throughout the entire claim.

Accordingly, Applicants' invention as now set forth in claim 11 is directed to a liquid chromatograph pump having a first or upstream-side plunger pump and a second or downstream-side plunger pump connected fluidly in series. A first check valve is arranged at an upstream side with respect to the first plunger pump and a second check valve is also claimed which is arranged between the first and the second plunger pumps.

The second check valve is arranged between the first and second plunger pumps to allow the liquid to flow from the first plunger pump towards the second plunger pump when the plunger of the second plunger pump moves backward to take the liquid into the second plunger pump and the plunger of the first plunger pump moves forward to pressurize the liquid in the first plunger pump to make the flow rate of the liquid discharged from the first plunger pump greater than the flow rate of the liquid taken into the second pump.

In other words, the second check valve enables the first plunger pump to supply a total amount of the flow rate of the liquid taken into the second plunger pump as well as the flow rate of the liquid discharged from the second plunger pump to the outside of the liquid chromatograph pump. It is noted that even when the plunger of the second pump moves backward to take the liquid into the second pump, the total flow rate of the liquid needs to be discharged from the liquid chromatograph pump through the second pump, as shown in Fig. 5 of the application.

As discussed hereafter, Applicants invention as set forth in claim 11 patentably distinguishes over the Bez '443 patent.

Initially, it is noted that Applicants' invention is specifically directed to a liquid chromatograph pump whereas the Bez patent is directed to a different kind of pump in that it is a multiple stage vacuum pump utilizing only a single piston and cylinder assembly and which has only a single drive unit 12 having a single electric motor 20.

Moreover, in Bez, the single piston and cylinder assembly has an enlarged diameter central portion with an end portion and opposite side portions of the enlarged diameter portion providing three compressive stages which can be connected in at least three different ways.

Applicants claim 11 now calls for liquid chromatograph pump having a first motor for driving a plunger of the first pump and a second motor for driving a plunger of the second pump whereby the plunger of the first pump and the plunger of the second pump maybe driven at different speeds from each other. The Bez pump only provides a single motor and the pistons 42 and 72 referred to by the Examiner cannot be driven at different speeds as in Applicants' invention.

Moreover, in the multi-stage vacuum pump of Bez, the one way valve 108, indicated by the Examiner to correspond to the second check valve of Applicants' invention, is arranged between a second pump stage and a third pump stage to allow gas to flow from the second pump stage to the third pump stage when the enlarged diameter portion 76 moves upward. In Bez, however, the enlarged diameter portion having the identical diameter for both the second and third stages and driven at the identical velocity for both of the second and third stages cannot make the flow rate of the liquid discharge from the upstream-side or first plunger pump greater than the flow rate of the liquid taken into the downstream-side or second plunger pump as in the present invention.

More specifically, in Bez, the one way valve 108, corresponding to the second check valve of the claimed invention, prevents the flow therethrough when the upstream-side piston moves backward to take the fluid into the upstream-side pump stage and the downstream-side piston moves forward to discharge the fluid from the downstream-side pump stage and allows the flow therethrough when the upstream-side piston moves forward to discharge the fluid from the upstream-side pump stage toward the downstream-side pump stage and the downstream-side piston moves backward to take the fluid into the downstream-side pump stage from the upstream-side pump stage. However, since the upstream-side piston and the downstream-side piston are equal to each other in diameter and driven speed, the flow rate taken into the downstream-side pump stage and the flow rate discharged from the

upstream-side pump stage toward the downstream-side pump stage are equal to each other.

Therefore, the one-way valve 108 of Bez is clearly different from the second check valve of the claimed invention enabling the flow rate discharged from the upstream-side pump stage toward the downstream-side pump stage to be greater than the flow rate taken into the downstream-side pump stage from the upstream-side pump stage so that the constant flow rate of the liquid can be discharged continuously from the downstream-side plunger pump even when the downstream-side plunger moves backward to take the liquid into the downstream-side plunger pump.

The liquid chromatograph pump of the present invention as now claimed needs to continuously discharge the liquid without interruption of the liquid discharge. The vacuum pump disclosed by Bez, however, it does not discharge the gas continuously. In other words, a function necessary for the check valve between the pump stages in Applicants' liquid chromatograph pump is clearly different from a function necessary for the check valve between the pump stages in the vacuum pump of Bez. Thus, the vacuum pump of Bez does not anticipate nor render obvious the present invention relating to a liquid chromatograph pump as now claimed in claim 11. Therefore, claim 11 is patentable.

With respect to claims 5 and 6, both of these claims contain the significant limitation that "one end part of the second plunger on a side remote from a drive side is exposed to a gas atmosphere".

In setting forth the teachings of Bez on pages 4 and 5 of the Office Action, the Examiner does not even suggest that Bez discloses this limitation of one end part of the second plunger on the side remote from a drive side is exposed to a gas atmosphere. Accordingly, claims 5 and 6 are patentable for this reason as well as for the reasons advanced with respect to claim 11 from which they depend.

With respect to the Sugiyama et al. and Gerhardt et al. patents cited in combination with Bez in connection with rejection of claims 7 and 9, Sugiyama et al. is directed to a liquid chromatographic apparatus having a flow cell provided with a cell body having an inlet flow passage, a detection flow passage, an outlet flow

passage and windows fixed to the cell body on both sides of the detection flow passage. Gerhardt et al. is directed to a hydraulic amplifier system for an ultra-high pressure liquid chromatography system which includes a hydraulic cylinder comprising a primary piston chamber in which a primary piston is disposed and a secondary piston chamber in which a secondary piston is disposed. Neither of these patents, taken alone or in combination with each other and Bez, render any of claims 7-9 unpatentable since these claims are dependent from claim 11 and are patentable for the reasons set forth in connection with claim 11 as well as for the additional subject matter recited in these two claims.

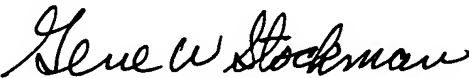
Claim 11, and claims 5, 6, 7 and 9 depending therefrom, should be allowed.

CONCLUSION

In view of the foregoing, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

To the extent necessary, Applicant petitions for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Mattingly, Stanger, Malur & Brundidge, P.C., Deposit Account No. 50-1417 (referencing attorney docket no. 500.43232X00).

Respectfully submitted,


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